

CLAIMS

What is claimed is:

1 1. A semiconductor device with ancillary electronic component comprising:  
2 a semiconductor device including a first connection to a first electrical line and  
3 a second connection to a second electrical line; and  
4 an ancillary electronic component connected directly to the semiconductor  
5 device and connected between the first connection and the second  
6 connection.

1 2. The semiconductor device of claim 1 further comprising connecting means for  
2 connecting the semiconductor device to a second electronic component, the connecting  
3 means providing clearance to accommodate the ancillary electronic component  
4 between the semiconductor device and the second electronic component.

1 3. The semiconductor device of claim 1 further comprising:  
2 a plurality of electrical contact elements connected to and extending a first  
3 distance from the semiconductor device;  
4 the ancillary electronic component extending from the semiconductor device a  
5 second distance, the second distance such that when the semiconductor  
6 device is connected to a corresponding second component, the  
7 ancillary electronic component will fit at least in part between the  
8 semiconductor device and the corresponding second component.

1 4. The semiconductor device of claim 3 wherein at least some of the plurality of  
2 electrical contact elements are composite, free-standing resilient contact structures and  
3 wherein said ancillary electronic component is a travel stop structure which defines a  
4 minimum separation between said semiconductor device and the corresponding  
5 second component.

1 5. The semiconductor device of claim 3 wherein at least some of the plurality of  
2 electrical contact elements are free-standing resilient contact structures primarily  
3 comprising a resilient material.

1 6. The semiconductor device of claim 1 further comprising:  
2 a second electronic component comprising in turn a plurality of electrical  
3 contact elements connected to and extending a first distance from the  
4 second electronic component, the plurality of electrical contact elements  
5 for connecting to the semiconductor device;  
6 the ancillary electronic component extending from the semiconductor device a  
7 second distance, the second distance such that when the semiconductor  
8 device is connected to the second electronic component, the ancillary  
9 electronic component will fit at least in part between the semiconductor  
10 device and the second electronic component.

1 7. The semiconductor device of claim 6 wherein at least some of the plurality of  
2 electrical contact elements are composite, free-standing resilient contact structures.

1 8. The semiconductor device of claim 6 wherein at least some of the plurality of  
2 electrical contact elements are free-standing resilient contact structures primarily  
3 comprising a resilient material.

1 9. The semiconductor device of claim 6 wherein the second electronic component  
2 is a printed circuit board.

1 10. The semiconductor device of claim 6 wherein the second electronic component  
2 is a socket.

1 11. The semiconductor device of claim 1 further comprising:  
2 a first terminal adjoining the surface of the semiconductor device for  
3 connecting to first circuitry of the semiconductor device;  
4 a second terminal adjoining the surface of the semiconductor device for  
5 connecting to second circuitry of the semiconductor device, and  
6 wherein the ancillary electronic component is electrically connected to  
7 the first terminal and the second terminal.

1 12. The semiconductor device of claim 11 wherein the ancillary electronic device is  
2 a capacitor.

1 13. The semiconductor device of claim 11 wherein the first circuitry is Vdd and the  
2 second circuitry is Vss, and the ancillary electronic device is a capacitor.

1 14. The semiconductor device of claim 11 wherein the second circuitry is ground.

1 15. The semiconductor device of claim 11 wherein the first circuitry is a first  
2 voltage level and the second circuitry is a second voltage level.

1 16. The semiconductor device of claim 15 wherein the first and second voltage  
2 levels are each selected from the group consisting of Vdd, VddA, VddB, Vss, VssA,  
3 VssB, Vref and ground.

1 17. The semiconductor device of claim 1 further comprising a plurality of such  
2 ancillary electronic devices.

1 18. The semiconductor device as in claim 3 wherein said ancillary electronic  
2 component is selected from the group consisting of: (a) a capacitor; (b) a resistor; (c)  
3 an inductor; (d) a transistor; (e) a semiconductor integrated circuit; and wherein said  
4 semiconductor device comprises an integrated circuit.

1 19. The semiconductor device as in claim 18 wherein said ancillary electronic  
2 component is mounted directly on said semiconductor device.

1 20. An assembly comprising said semiconductor device as in claim 3 wherein said  
2 corresponding second component comprises another plurality of electrical contact  
3 elements connected to and extending a first distance from said corresponding second

4 component, said another plurality of electrical contact elements for making electrical  
5 contact with said semiconductor device.

1 21. An assembly as in claim 20 wherein said corresponding second component  
2 comprises a printed circuit board.

1 22. An assembly as in claim 20 wherein said corresponding second component is  
2 arranged in a spaced apart relation to and generally parallel with said semiconductor  
3 device.

1 23. An assembly as in claim 1 wherein said ancillary electronic component  
2 comprises a travel stop structure which defines a minimum separation between a  
3 surface of said semiconductor device and another surface.

1 24. A semiconductor assembly comprising:  
2 a semiconductor integrated circuit (IC) having interconnection pads fabricated  
3 on a surface of said semiconductor integrated circuit and having an  
4 insulating layer which exposes said interconnection pads;  
5 a first circuit element in a structure attached to said surface, said first circuit  
6 element being coupled electrically to a second circuit element in said  
7 semiconductor integrated circuit.

1 25. A semiconductor assembly as in claim 24 wherein said structure is a travel  
2 stop structure which defines a minimum separation, between said surface and a

3        substrate having a contact element disposed on said substrate, in which said contact  
4        element is electrically coupled to said semiconductor integrated circuit.

1        26.      A semiconductor assembly as in claim 25 wherein said first circuit element  
2        comprises a ground shield.

1        27.      A semiconductor assembly as in claim 25 wherein said first circuit element  
2        comprises one of (a) a capacitor; (b) a resistor; (c) a driver circuit; (d) an inductor; (e)  
3        a shield; or (f) a routing trace.

1        28.      A semiconductor assembly as in claim 25 wherein said structure comprises a  
2        multilayer structure which is formed after said semiconductor IC is created.

1        29.      A semiconductor assembly as in claim 24 wherein said first circuit element  
2        comprises an insulated ground shield.

1        30.      A semiconductor assembly as in claim 24 wherein said first circuit element  
2        comprises one of (a) a capacitor; (b) a resistor; (c) a driver circuit; (d) an inductor;  
3        (e) a shield; or (f) a routing trace.

1        31.      A semiconductor assembly as in claim 24 wherein said structure comprises a  
2        multilayer structure which is formed after said interconnection pads and said insulating  
3        layer have been formed on said semiconductor IC.

1 32. An interconnect assembly comprising:  
2 a substrate;  
3 a resilient contact element having at least a portion thereof which is capable of  
4 moving to a first position in which said resilient contact element is in  
5 mechanical and electrical contact with another contact element, said  
6 resilient contact element being disposed on said substrate;  
7 a stop structure disposed on said substrate, said stop structure defining said  
8 first position and containing a first circuit element which is coupled to a  
9 second circuit element on said substrate.

1 33. An interconnect assembly as in claim 32 wherein said another contact element  
2 is disposed on another substrate, and wherein said stop structure defines a separation  
3 between said substrate and said another substrate in which said resilient contact  
4 element is in mechanical and electrical contact with said another contact element.

1 34. An interconnect assembly as in claim 33 wherein said stop structure is  
2 disposed proximally adjacent to said resilient contact element on said substrate.

1 35. An interconnect assembly as in claim 33 wherein said resilient contact element  
2 comprises a spring structure.

1 36. An interconnect assembly comprising:  
2 a first substrate;  
3 a first contact element disposed on said first substrate;

4                   a stop structure disposed on said first substrate, said stop structure defining a  
5                   first position of a resilient contact element in which said resilient  
6                   contact element is in mechanical and electrical contact with said first  
7                   contact element and wherein said stop structure comprises a first circuit  
8                   element.

1   37.   An interconnect assembly as in claim 36 wherein said resilient contact element  
2   is disposed on a second substrate and wherein said resilient contact element has at  
3   least a portion thereof which is capable of moving to said first position when said  
4   resilient contact element is compressed.

1   38.   An interconnect assembly as in claim 37 wherein said stop structure is  
2   disposed proximally adjacent to said first contact element.

1   39.   An interconnect assembly as in claim 37 wherein said first circuit element  
2   comprises a ground shield.

1   40.   An interconnect assembly as in claim 37 wherein said first circuit element is  
2   coupled to a second circuit element in said first substrate.

1   41.   An interconnect assembly comprising:  
2                   a first substrate having a first surface with first contact elements;

3           a second substrate having a second surface with second contact elements, said  
4           first surface facing said second surface and wherein a space exists  
5           between said first surface and said second surface;  
6           a plurality of interconnect elements, each respectively electrically coupling a  
7           contact element of said first contact elements to a contact element of  
8           said second contact elements;  
9           an electrical component attached to one of said first surface and said second  
10          surface and occupying at least a portion of said space and coupled to at  
11          least one contact element of said first contact elements or said second  
12          contact elements.

1   42.   An interconnect assembly as in claim 41 wherein said first substrate comprises  
2   a semiconductor integrated circuit and wherein said plurality of interconnect elements  
3   are attached mechanically to at least one of said first substrate and said second  
4   substrate.

1   43.   An interconnect assembly as in claim 42 wherein said second substrate  
2   comprises a printed circuit board and said electrical component is selected from the  
3   group consisting of (a) a capacitor; (b) a resistor; (c) an inductor; (d) a transistor;  
4   and (e) another semiconductor integrated circuit.

1   44.   An interconnect assembly as in claim 41 wherein said electrical component  
2   comprises a travel stop structure which defines a minimum separation between said  
3   first surface and said second surface.

- 1 45. An interconnect assembly as in claim 43 wherein said plurality of interconnect
- 2 elements comprise free-standing resilient contact structures.

  

- 1 46. An interconnect assembly as in claim 43 wherein said plurality of interconnect
- 2 elements comprise ball structures.